

Amendments to the Claims

This listing of claims will replace all prior listings of claims in the application.

Listing of Claims

1. - 4. (Canceled)

5. (Currently Amended) A method for monitoring operating conditions on one or more units of rotating equipment disposed within a facility which rotating equipment comprises a drive component having a rotating shaft and a driven component having a rotating part connected to said shaft, said rotating equipment including bearings therein which rotatably support said shaft and said rotating part thereon, and said rotating equipment including a process fluid and a shaft seal arrangement having a mechanical seal that comprises seal rings cooperating with said shaft which prevents are relatively rotatable and prevent leakage of said process fluid along said shaft, said seal arrangement including a fluid chamber adjacent said seal rings and passages therein containing a passage fluid supplied to said that fluid chamber of said mechanical seal such that said passage fluid circulates through said fluid passage to maintain an operating temperature of said seal rings, said rotating equipment further including external exposed surfaces respectively adjacent said bearings and said passages wherein each of said exposed surfaces has a surface temperature defined by the operating conditions of said respective bearing or passage fluid which said surface temperatures vary in response to the operating conditions of said bearings and said shaft seal arrangement, the method comprising the steps of:  
providing a temperature data collector which is manually movable within said facility by an operator, said temperature data collector having a temperature sensor which is manually positionable within said facility by said operator to detect

said surface temperatures of said rotating equipment, said temperature data collector further including a data storage unit which receives and stores temperature data from said sensor;

defining temperature sensing locations on said rotating equipment, said sensing locations being defined on said exposed surfaces adjacent said bearings and said passages, each said temperature sensing location associated with a said bearing indicating an operating temperature of said associated bearing, and each said sensing location associated with a said passage indicating a temperature of said passage fluid therein;

performing a temperature data collection procedure on said rotating equipment, said temperature data collection procedure comprising the steps of manually transporting said temperature data collector within said facility to an equipment location proximate each said unit of said rotating equipment and manually positioning said temperature sensor adjacent to said sensing locations on said rotating equipment, detecting surface temperatures on said rotating equipment for said bearings and said passage fluid by temperature readings of said sensing locations through said temperature sensor, and storing temperature data from each said temperature reading in said data storage unit of said data collector;

repeating said data collection procedure periodically over time to detect and store said temperature data at periodic time intervals by manually transporting and returning said temperature data collector to said equipment location and repositioning said temperature sensor adjacent to said sensing locations;

said data collection procedure further including the step of removing said temperature sensor from said equipment location by manually moving said temperature data collector to another location in said facility; and

analyzing said temperature data by comparing each said temperature data from a last said temperature data collection

procedure performed with reference temperature data to identify temperature increases in said rotating equipment indicating abnormal operating conditions of said bearings ~~and/or~~ and said shaft seal arrangement when said increases exceed an acceptable amount as compared to said last temperature data collection period and then performing preemptive repair based on said abnormal operating conditions indicated by said temperature increases.

6. (Canceled)

7. (Currently Amended) The method according to ~~Claim 6,~~ Claim 11, wherein said data collection procedure includes the step of manually relocating said temperature data collector to said processing station for said transferring of said temperature data thereto, said transferring of said temperature data being performed prior to performance of the next said data collection procedure.

8. (Canceled)

9. (Canceled)

10. (Currently Amended) The method according to ~~Claim 1,~~ Claim 5, wherein a plurality of said units of said rotating equipment are provided which define a plurality of said equipment locations, said temperature data collector being moved from one said equipment location to a next said equipment location during said temperature data collection procedure to detect said surface temperatures of said bearings and said passage fluid for each of said units.

11. (Previously Presented) The method according to Claim 5, wherein said method further comprises the steps of providing a remote processing station separate from said rotating equipment, and transferring said temperature data

from said data storage unit of said temperature data collector where said processing station performs said analyzing step.

12. (Previously Presented) The method according to Claim 11, wherein said processing station is a computer disposed within said facility.

13. (Currently Amended) The method according to Claim 5, wherein said temperature data collector is a handheld unit comprising said temperature sensor and said data storage unit which are disposed within said handheld unit so as to be are moved together by the operator.

14. (Currently Amended) The method according to Claim 5, wherein said passage fluid is supplied from said process fluid and an increase in said temperature of said passage fluid is caused by heat generation from said seal rings.

15. (Currently Amended) A method for monitoring the operating conditions of a plurality of units of rotating equipment within a facility, said rotating equipment including relatively rotatable parts which comprise a rotating shaft, bearings which support the shaft, and a shaft seal assembly comprising a mechanical seal which ~~seals~~ includes relatively rotatable seal rings, said seal rings sealing a sealed fluid within said rotating equipment during shaft rotation to prevent said sealed fluid from leaking along said shaft, said rotating equipment including a fluid chamber adjacent said seal rings and a fluid passage in open communication with said fluid chamber wherein a passage fluid flows between said fluid chamber and said fluid passage and along said seal rings to maintain an operating temperature of said seal rings, said rotating equipment having exterior surfaces which have surface temperatures which indicate the respective operating temperatures of the bearings and the shaft seal assembly, the method comprising the steps of:

providing a portable temperature data collector which is manually movable within said facility by an operator, said temperature data collector including a temperature sensor which is manually positionable adjacent to said exterior surfaces to detect said surface temperatures of said exterior surfaces associated with said bearings and with said passage fluid of said shaft seal assembly and which generates temperature data indicating said surface temperatures detected thereby, said sensor communicating with a data storage unit which receives and stores said temperature data for subsequent analysis;

defining temperature sensing locations on said rotating equipment respectively corresponding with each of said rotatable parts wherein said surface temperature on said rotating equipment at each said sensing location indicates the operating temperature of said respective rotating part corresponding thereto, at least one of said temperature sensing locations being adjacent said passage spaced from said seal rings;

performing a temperature data collection procedure on said rotating equipment at a collection time to determine the operating temperatures of said respective rotatable parts at said collection time, said temperature data collection procedure comprising the steps of manually transporting said temperature data collector within said facility to an equipment location proximate each said unit of said rotating equipment being monitored, manually positioning said temperature sensor adjacent to a plurality of said sensing locations, detecting said surface temperatures of said exposed surfaces at said plurality of said sensing locations with said temperature sensor and generating said temperature data corresponding to each of said sensing locations corresponding to said bearings and said passage fluid of said mechanical seal, storing said temperature data for said bearings and said mechanical seal in said data storage unit, and manually removing said temperature data collector from each said

equipment location after obtaining said temperature data for said sensing locations within said equipment location;

repeating said data collection procedure at subsequent collection times to detect and store said temperature data for each said collection time wherein said collection times are spaced from each other by selected time intervals and said temperature data collector is transported to each said equipment location and then removed therefrom at the end of each said data collection procedure;

storing said temperature data associated with each of a plurality of collection times to develop historical data for each said sensing location; and

analyzing said historical data by comparing the temperature data from a last said temperature data collection procedure with the temperature data from a prior said data collection ~~procedures-procedure~~ to identify abnormal ~~changes~~ increases in said operating temperatures of said rotatable parts wherein said abnormal temperature increases exceed a defined amount when compared to said prior data collection procedure, and wherein said increase in said temperature of said passage fluid is caused by heat generation from said seal rings; and

operating said rotating equipment in response to any said abnormal ~~changes-increases~~ identified by said abnormal temperature increases identified by said analysis in said bearings ~~and/or-and~~ said shaft seal assembly.

16. (Previously Presented) The method according to Claim 15, which includes the step of providing a processing unit which receives said temperature data and analyzes said historical data.

17. (Previously Presented) The method according to Claim 16, which includes the step of transferring said temperature data to said processing unit after each said temperature data collection procedure.

18. (Previously Presented) The method according to Claim 17, which includes the step of connecting said temperature data collector to said processing unit for said transferring of said temperature data.

19. (Currently Amended) The method according to Claim 15, wherein one said sensor is used for detecting temperature at a plurality of said sensing locations.

20. (Previously Presented) The method according to Claim 15, wherein said sensor is a portable sensor which is manually directed toward each said sensing location to detect said surface temperatures.

21. (Previously Presented) The method according to Claim 15, wherein each temperature data collection procedure at each said collection time includes positioning said temperature sensor at a plurality of said equipment locations corresponding to a plurality of units of said rotating equipment such that said temperature data for each said collection time relates to said plurality of said units of said rotating equipment.

22. (Previously Presented) The method according to Claim 21, wherein said temperature data for said plurality of said units of said rotating equipment is stored in said data storage unit until the end of said temperature data collection procedure.